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SYNONOMIZATION OF THE EUPHONIOUS *ARCTONOTUS* BOISDUVAL, 1852 (SPHINGIDAE: MACROGLOSSINAE) BASED ON MOLECULAR PHYLOGENETIC ANALYSIS

Additional key words: Bear Sphinx, cytochrome oxidase I, elongation factor-1α-, *lucidus*, paraphyly, *Proserpinus*, wingless

Arctonotus Boisduval, 1852 is a monotypic hawkmoth genus proposed for the type species, *A. lucidus* Boisduval, 1852. In their monumental revision, Rothschild & Jordan (1903) inexplicably transferred *Proserpinus terlooii* Henry Edwards, 1875 to *Arctonotus*. This error was repeated by a few other workers (e.g., Holland 1903; d'Abrera 1987; Comstock 1948), but Hodges (1971) and Tuttle (2007) correctly recognized the many morphological similarities tying P. *terlooii* to the rest of *Proserpinus* Hübner, [1819]. Less clear were those features tying *A. lucidus* to *Proserpinus*, and the validity of *Arctonotus* as a genus distinct from *Proserpinus* has never been challenged, though several authors recognized the possibility of a sister taxon relationship (Hodges 1971; Kitching & Cadiou 2000; Tuttle 2007). Pronounced, ciliate male antennae and unusually heavy adult vestiture drove the recognition of *Arctonotus* (Boisduval, 1852). Additional unusual traits including a winter flight period, a reduced, vestigial proboscis, loss of the pulvillus, and inferred physiological adaptations required to fly in very cold temperatures (Edwards 1875; Holland 1903; Rubinoff 2002) are unique to *Arctonotus* and equivocally support its separation from *Proserpinus*.

However, we have suspected that *Arctonotus* might not be the sister taxon to *Proserpinus* but rather that *A. lucidus*' traits were derived by intense selective pressures associated with the winter flight period. This position is supported by many morphological and ecological similarities between the two genera. *Arctonotus lucidus* shares the green adult coloration, pattern of forewing banding, hindwing maculation and color all nearly identical to *P. terlooii* and *P. vega* (Dyar, 1903). Larvae of *A. lucidus* and all but one *Proserpinus* (*P. terlooii*) feed exclusively on Onagraceae. Further, the genera share virtually identical larval morphology and development patterns, including a dramatic change in the final instars (Osborne 1995, 2000; Rubinoff 2002; Tuttle 2007). In particular, color and maculation of fifth instar *A. lucidus* and *P. terlooii* are very similar (Osborne pers. obs.) whereas these traits are widely divergent and varied across other *Proserpinus* (Osborne 1995, 2000; Tuttle 2007). These morphological characters, though highly suggestive, have never lead to more than a proposed sister-taxon relationship between *Arctonotus* and *Proserpinus* (Hodges 1971; Kitching & Cadiou 2000; Tuttle 2007).

Reeent molecular phylogenetic analysis (Fig 1.) has demonstrated that not only is *Arctonotus lucidus* a member of *Proserpinus*, but also that *A. lucidus* is decply nested among the other species of *Proserpinus*, rendering *Proserpinus* paraphyletic and therefore systematically uninformative (Rubinoff & Le Roux 2008). Rubinoff and Le Roux's initial findings were subsequently corroborated with a different set of genes (Kawahara *et al.* 2009). Thus, the dramatic differences in the ecology and physiology of *Arctonotus lucidus* belie a phylogenetic relationship that places the genus squarely within *Proserpinus*. This is remarkable because it suggests the possibility of saltational evolution in those particular characters that have changed so dramatically in *Arctonotus* (Rubinoff & Le Roux 2008), while genes of *A. lucidus* have remained very typical of *Proserpinus*. A discussion of the evolutionary implications and phylogenetics of *Proserpinus* and *Arctonotus* is detailed in Rubinoff & Le Roux (2008). Because *Proserpinus* has priority, the nomenclatural change placing *Arctonotus* as a junior synonym and thereby maintaining the monophyly of *Proserpinus* is proposed here.

Proserpinus lucidus (Boisduval)
= [Combination Revised]: *Arctonotus lucidus* Boisduval, 1852: 319. **comb. rev.**

We propose to maintain the common name Bear Sphinx for *P. lucidus*, in use for over a century (Holland 1903). The Greek root of *Arctonotus* refers to the stout, hairy ursine quality of the adult moth, and while the generic placement has changed, this reference remains accurate. Occasionally websites and authors have used 'Pacific Green Sphinx' for *P. lucidus*, but this more rcecnt common name has no connection to the original description. It is further disadvantaged and confused due to the presence of *P. clarkiae*, another green *Proserpinus* widespread across the Pacific Region of North America.

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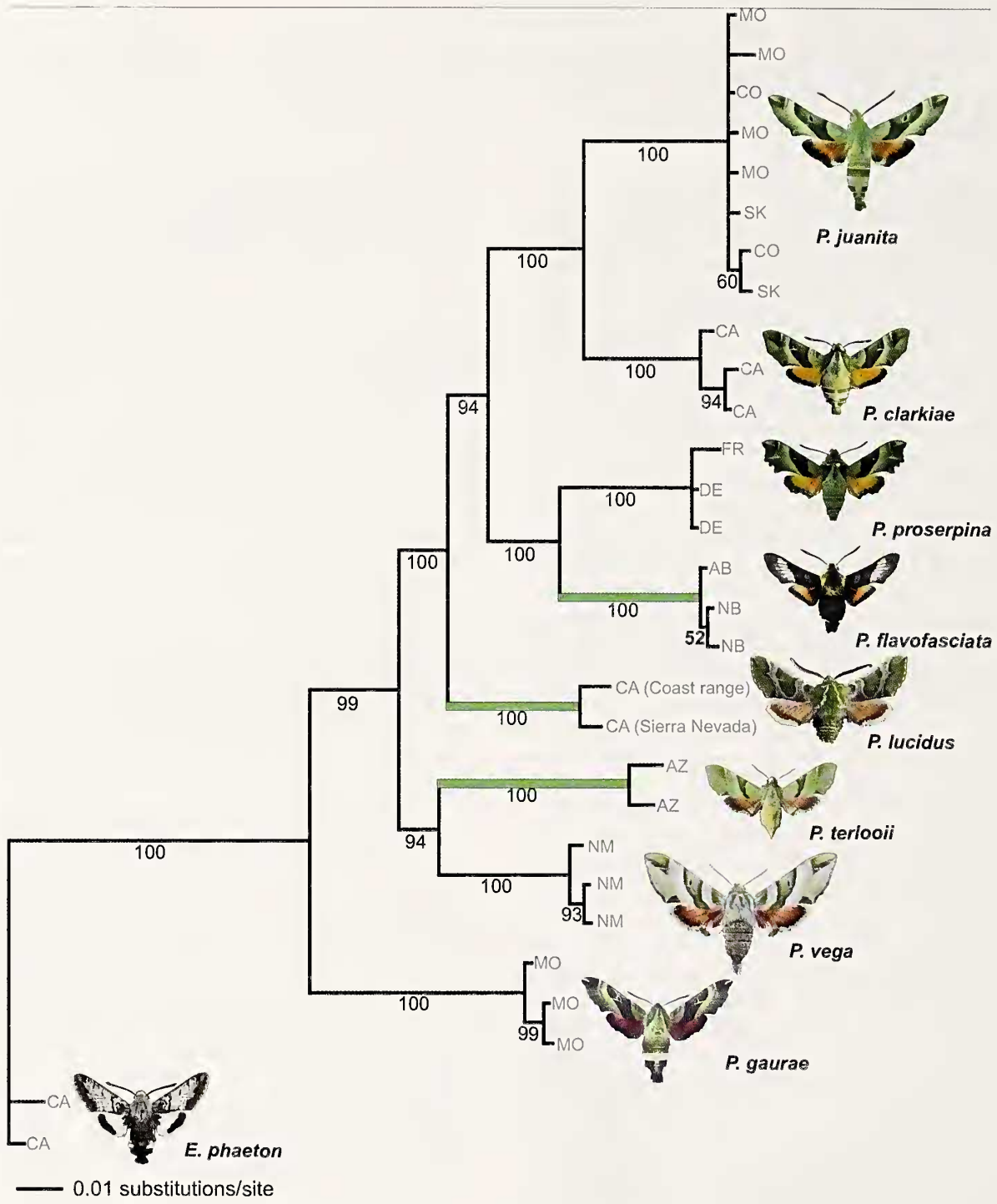

FIG. 1. Phylogeny of *Proserpinus*. *Euproserpinus phaeton* Grote & Robinson used as an outgroup. Modified from Rubinoff & Le Roux (2008), Bayesian consensus tree generated with posterior probabilities inferred from 1,965 base pairs of combined COI, EF-1α, and wingless DNA sequence data. Branch support is given as posterior probabilities (numbers beneath branches). Length of branches corresponds to number of substitutions per site. Accession location data are mapped onto the tree (AB, Alberta [Canada]; AZ, Arizona; CA, California; CO, Colorado; DE, Germany; FR, France; MO, Missouri; NB, New Brunswick [Canada]; NM, New Mexico; SK, Saskatchewan [Canada]). Saltational taxa are highlighted in green.

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